A bioherbicide to control invasive weeds in the West

Cheatgrass, medusahead and jointed goatgrass are invasive annual grass species that increase fire frequency of rangelands; negatively affect cereal production in cropland; choke out the native species in the shrub-steppe of the western United States (US) rangeland; and reduce habitat for sagebrush-dependent wildlife. These three weeds are responsible for many wildfires that destroy property and result in loss of life.

Dr. Ann Kennedy, an Agricultural Research Service scientist, has identified naturally occurring bacteria from the soil and root surface that inhibit these invasive weeds. The bacterium, *Pseudomonas fluorescens* strain ACK55, which inhibits only cheatgrass, medusahead, and jointed goatgrass*,* and does not inhibit any economically important plants nor does it injure any native plant species in the US. These weed-suppressive bacteria:

- are applied in the in the fall and establish in the soil microbial community during the fall through spring to reduce cheatgrass root growth and seedling vigor during this time;
- inhibit radicle formation, root growth and tiller initiation of these weeds;
- do not harm native plants or crops;
- grow well in fall and spring coinciding with the early root growth of the fall annual weeds; and
- grow down roots and deliver the weed-inhibitory compound.

It is important for users to recognize that this product does not much of an effect on established cheatgrass plants, it inhibits establishment; and it is only effective during cool weather.

Application of the weed-suppressive bacteria result in almost complete suppression of these fall annual grass weeds five to 6 years after application, when desirable plants (winter wheat, perennial bunchgrasses, natives) were present. In addition, none of the annual grass weeds remained in the seed bank five to seven years after a single bacteria application. Additional applications of the bacteria may be needed in three to six years if weeds or weed-laden soil is transported in to the site.

With the reduction of these annual grass weeds, other plant species are more competitive. The bacteria suppress weed roots at a time when the weed is increasing its competitive root growth. These bacteria provide a novel means to reduce invasive weeds. Because of its selectivity, this bacterium can be used in management of the invasive weeds cheatgrass, medusahead and jointed goat grass in rangeland, cropland, pasture, turf, sod production, golf courses, road sides and road cuts, construction sites, and right-of-ways (road, rail, pipeline, electrical).

USDA has requested that EPA provide an expedited review of the application package for the registration of the bioherbicide ACK-55. Registering this biopesticide is a priority for the USDA, the ARS research program and the US Forest Service program. The addition of ACK-55 is an important tool to control these invasive weeds at a larger scale. Use of this biopesticide will heighten efforts to protect landscapes from the threat of cheatgrass and fire, to protect the habitat for the greater sage-grouse (which was not listed under Endangered Species Act in Sept. 2015, and we hope to further improve populations of this at-risk bird), and for the benefit of public lands users. If the registration is approved quickly, the land managers in the US Forest Service, Bureau of Land Management, US Fish and Wildlife Service and National Park Service can use the bioherbicide in the fall 2016 (it is a fall-applied product). Also, the USDA Natural Resources Conservation Service can invite private landowners to use the biopesticide.

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